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Abstract

Organic farming may present opportunities for job creation over and above those provided by conventional agriculture; this study is one of a small number to have empirically examined this proposition. We compared countywide averages of hired farm labor from the USDA's 2007 Agricultural Census with data collected through a mirrored survey of organic farmers in the same counties in Washington and California. Based on mixed-effects linear models to estimate differences (if any) in employment between organic farms and countywide farm averages, our analysis indicated that organic farms employed more workers per acre (95% CI: 2-12% more). Further, a greater proportion (95% CI: 13-43% more) of hired labor on organic farms worked 150 days or more compared to the average farm, suggesting increased labor requirements—and potentially more secure employment—on organic farms. We conclude the present study by considering possible policy implications of our findings with regards to organic agriculture as part of regional economic development strategies.

Keywords

Organic farming, conventional farming, employment, labor, regional economic development

Introduction

Organic agricultural business organizations and think tanks have often spoken of the job creating potential of organic farming as established fact (Bama, 2011). Numerous politicians, including former U.S. President Barack Obama, have argued that funding rural and organic farming can create more jobs in the American economy (Glynn, 2011). This study seeks to empirically consider such claims, and to estimate possible differences in hired labor patterns in conventional farming versus organic farming in the U.S.

The global organic agricultural market has grown from approximately US\$17.9 billion in 2000 to almost US\$82 billion in 2015, and the organic market is projected to continue seeing “healthy growth” in the future (Sahota, 2017; Willer and Lernoud, 2017). Yet in 2011, organic farming made up only 0.64 percent of all U.S. cropland (United States Department of Agriculture [USDA], 2013), and demand continued to outstrip supply (Sahota, 2017), indicating room for production and employment.

Parallel to growth in the organic industry, the organic food movement has become an increasingly influential part of the growing number of visions for a new food system (Johnston and MacKendrick 2013; Chappell, 2013). Farmers—both new and established—are interested in organic farming; consumers are interested in sustainability and the presence of pesticides in food and in the environment; and alternative agri-food movements are advocating for structural change in the food system (Willer and Lernoud,

2017; Fernandez et al., 2013). Organic agriculture can be defined as an approach seeking “a restructuring of the whole farm system,” based on promoting and enhancing “ecosystem health whilst minimizing adverse effects on natural resources” (Morison et al., 2005) although the varying “strands” within organic agriculture range from neoliberal/reformist to progressive/radical approaches to these goals (Holt-Giménez and Shattuck, 2011). The continued rapid growth of the organic industry, and the new visions produced and advocated for by alternative agri-food movements reinforce the possibility that organic farming could significantly contribute to a re-creation and reinvigoration of the structure of local political economies. This is particularly true for rural economies, in part through including new visions of food security and local employment (Morison et al., 2005; Orr, 1994; Pinchot, 2014).

This study addresses the employment question specifically by comparing data obtained through surveys of organic farmers in 10 counties in California and Washington with the statistics reported for comparable farms located in the same counties, based on USDA census data. We test the basic proposition that organic agriculture employs more labor than the average (usually conventional) farm, as a contribution to the determination of whether or not organic farming can be part of a viable job-creation strategy. Although related questions of labor practices, compensation, and quality-of-life are vitally important (e.g., as analyzed by Guthman, 2014, among others), these issues were not directly examined in the current study.

Organic Farms and Labor in the United States

There has been a limited amount of systematic research on the subject of the labor-creation impacts of organic agriculture in the United States. Organic agriculture is

generally understood to require additional labor in comparison to conventional practices, including greater human labor needs to weed crops and manage rotation cycles because of the (sometimes) greater use of the underlying complexities of agroecosystems (Jansen, 2000; Vandermeer & Perfecto, 2017). The use and cultivation of mixed farming and labor-intensive crops like fruits and vegetables creates the need for additional on-site employment (Jansen, 2000; Morison et al., 2005).

Organic research institutes and trade and policy advocacy organizations have steadily issued reports stating that organic farming uses more labor. While the methods of data collection and analysis vary, and in some cases are not specified, the consistency of the claims based on a modest number of studies reinforces the ongoing importance of further exploration and research. Continued data collection and analysis of these dynamics will allow the construction of a systematic understanding of when and where organic agriculture uses more labor, and enable rigorous examination of the implications and potential benefits. This knowledge, in turn, could be used to craft effective and supportive policies.

In the United States, studies have found that organic agriculture employs anywhere from 7 to 75% more labor than conventional agriculture (Beach, 2010; Brumfield et al., 2000; Granatstein, 2003; Karlen, Duffy & Colvin, 1995; Rodale, 2011; Santos & Escalante, 2010; Strohlic et al., 2008). However, at least in the case of the Rodale Institute's farm trials, Pimentel et al.'s (2005) peer-reviewed study found that while the organic system required 35% more labor than the conventional system, this hired labor "is spread out over the growing season," meaning that on an annual basis, "the hired labor costs per ha are about equal between the two systems" (p. 576). Using

data from the United States Department of Agriculture's *Organic Production Survey 2008* (USDA 2010) and the *2007 Census of Agriculture* (USDA 2009), Dimitri (2010) reported that "In every state, and nationally, organic farms hire labor at a greater rate than do their conventional counterparts," with 53% of organic farms reporting use of hired labor compared to the overall proportion of 22% of farms hiring labor for the entire sector. Further, she estimated that labor costs made up about 23% of organic production expenses, as opposed to 14% of total farm expenses for the average farm in the United States. Although Dimitri points out that the statistics she cites for organic and conventional are not strictly comparable due to problems with measurement and definition, her results are reinforced by the findings of Crowder and Reganold (2015), who found labor costs were statistically significantly higher (by 7-13%) in organic agriculture. Thus Dimitri's (2010) statement that organic farms "rely on hired labor more often, and... have higher labor costs on a percentage basis" appears to continue to be borne out by the data; Anderson's (1994, in Jansen, 2000) study of Wisconsin dairy farms offers one of the rare exceptions.

However, many of these previous studies in the U.S. have been based either on data collected from experimental stations/trials (e.g., Pimentel et al., 2005); a small number of studied farms (e.g., Nguyen & Haynes, 1995, in Pimentel et al., 2005); limited to specialty crops (Granatstein, 2003); conducted in systems outside the U.S. (see next section); based only on aggregate national or state level data (Dimitri, 2010); or report data based on labor costs rather than direct estimates of labor employed (Crowder and Reganold, 2015). While all of these make important contributions, the present study is

one of a small number to directly collect and analyze data at a state or regional level in the U.S. (but see Strohlic et al., 2008; Santos & Escalante, 2010).

Organic Farming and Labor in The European Union

The relationship between organic agriculture and job creation in Europe has similarly been discussed in a number of studies. Jensen (2000) cites estimates from different European countries and farming systems, finding anywhere from 5 to 101% greater labor use among organic dairies, vegetable farms, livestock breeding, and arable farming (though it is not clear if all these figures were normalized to labor use per unit area). Maynard and Green's (2006) survey of previous studies gives estimates ranging mostly between 9 and 34% more jobs per hectare in organic compared to non-organic agriculture, although one survey-based study estimating 64% more jobs per hectare. This would equate to thousands more jobs in the United Kingdom, they point out, reaching nearly 100,000 additional jobs if all agriculture in the U.K. was converted to organic agriculture. This bold proposition is reinforced by an additional point from one of the highlighted studies, Lobley et al. (2005), who found that "27% of organic farmers report increasing employment following conversion [from non-organic farming], employing on average an additional 1.73 FTE labour units," (p. 68). Jansen's (2000) literature review of studies across Europe, and Morison et al.'s (2005) peer-reviewed, survey-based study of farms in the U.K. and the Republic of Ireland, both further point out that labor use varies very strongly with farm size, with Morison et al. finding that very small farms in the U.K. using almost three orders of magnitude more labor per unit area than very large farms. When Morison et al adjusted their figures for this strong effect of farm size to match the overall existing farm size distributions in the U.K. and Ireland, they found that

organic agriculture employed nearly twice as much labor per hectare. And consistent with the studies in the U.S., Jansen (2000) and Lobley et al. (2005) find that context, crop or livestock type, diversification, social connections, and other factors strongly affect the socio-economic character of different kinds of farms, including their labor practices and effects on local economic development. (But see Konstantinidis, *forthcoming*, for a rare analysis showing lower use of labor, higher mechanization, and larger farm size in the European Union based on national aggregate data sets.)

Previous research from Europe thus generally (but not uniformly) supports the proposition that organic agriculture has greater labor demands, and can be an important part of a regional/rural economic development plan, warranting supportive policies and government investment to expand organic farming (Lobley et al., 2005; Maynard and Green, 2006; Morison et. al. 2005). Similar to some studies from the U.S., Lobley et al. found that the additional jobs in organic agriculture were more likely to be part-time and/or casual—offering flexibility, but lower job security. However, given the very different political economy of agriculture in the European Union, there is a continued need for U.S.-based research to continue clarifying the proposed relationships between organic agriculture and jobs. Further, although many of the European studies are based on survey data and not only experimental stations or aggregate statistics, few of these studies have been published as peer-reviewed papers, or indeed, appear to be easily available in any form. Thus the present study represents an important step in continuing to expand on and replicate existing studies from Europe and in the US context.

Data and Methods

In order to compare conventional agriculture labor requirements with organic agriculture labor needs, this study compared archival data from the USDA with a survey sent to organic farmers in California and Washington for the purpose of this research. As reviewed above, only a few studies have looked at the empirical, descriptive evidence of labor needs between conventional and organic farms in the United States.

We used data from the 2007 Census of Agriculture as a proxy for conventional farm data (hereafter referred to as “average farm” data) because it is estimated that only 0.7% of farms in this data set are organic. Therefore, comparing the data collected from a direct survey of organic farms in California and Washington to the average farm data from the same states provides a reasonable proxy for a comparison between organic and conventional farms.

We analyze the effects of farm type at the level of individual counties. The county was the lowest available level of disaggregation in the 2007 Census of Agriculture; so this level was used in the mirrored survey of organic farms.

Study limitations

As previously discussed, other variables may intervene in the hypothesized relationship between farm type and employment. Farm size is one of the most notable (Morison et al., 2005). Small and large farms have vastly different needs. A large farm might seek economies of scale that replace labor with mechanization, and reduce the need for (on-farm) labor by using pesticides and reducing diversity (Jansen, 2000; Pimentel and Dahzong, 1990). Therefore, we mirrored the categories of farm size (i.e., 1-9 acres,

10-49 acres, 50-179 acres, 180-499 acres, 500-999 acres, and 1,000 acres +) used in the 2007 Census of Agriculture in the survey of organic farms. However, the resulting dataset did not recover enough data on farm size to include it as a factor in our statistical analysis.

The type of crop was another exogenous variable considered in the study and that could impact the number of workers on average farms and on organic farms. For example, dairy, oilseed, tree fruit, vegetable production, and grain farms all have different labor needs and uses. Therefore, the designations used in the 2007 Census of Agriculture based on the North American Industry Classification System (NAICS) were mirrored in our survey of organic farms, in order to analyze farm labor with respect to these classifications. Ultimately, however, the survey responses collected for this variable yielded insufficient data to appropriately analyze the effect of crop type.

Lastly, at least two exogenous variables beyond the scope of this study also may impact the need for farm labor and differences between organic and non-organic farms. One of these variables is the overall economic environment of the United States: although organic products are increasingly part of U.S. households' regular purchases (The Nielsen Company, 2016), a poor economic environment, lower incomes, or higher prices may strongly affect consumers' purchases of organic products (The Nielsen Company, 2010; but see Dimitri & Dettman, 2012). Correspondingly, shifts in purchasing from organic to non-organic products could result in organic farms hiring fewer workers versus conventional farms. Similarly, workers' wages can impact the differences in farm labor on conventional and organic farms. The limited data available, from European cases, indicates different wage structures and costs on organic and non-organic farms, with

some evidence that (non-family) labor on organic farms is paid more (Jansen, 2000; Lobley et al., 2005; Maynard and Green, 2006; Offerman and Nieberg, 2000). Thus, if the cost of hiring workers is prohibitive, a farmer may decide to “make do” with fewer hired laborers or none at all, preferring to work longer hours (i.e., switch towards family labor, which Lobley et al., 2005, found garner *lower* wages than family labor in conventional agriculture) to achieve the same results. However, given that the 2007 Census of Agriculture contained no data on wages, wage data was correspondingly not solicited in our survey of organic farms.

Independent Variable: Farm Type

Farm type, organic or “average” farm, was the independent variable. A farm is defined as a “place that sells, or would normally sell, at least \$1,000 worth of agricultural products during the year” ((NASS) & Agricultural Statistics Board, 2011). A farm can have crops, livestock or both. An organic farm is one that has met the criteria of the USDA Organic regulations and has then been approved by a certifying organization. The USDA (2011) defines organic as

a labeling term that indicates that the food or other agricultural product has been produced through approved methods that integrate cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity. Synthetic fertilizers, sewage sludge, irradiation, and genetic engineering may not be used.

Conventional (or “non-organic”) farms are those that are not certified as organic under the guidelines established by the USDA. As previously stated, for this study, data

averaged over all farms (which are 99.3% non-organic) was used as a proxy for conventional farms.

The Dependent Variable: Jobs per acre and proportion of jobs that are full-time

To determine employment rates (labor use) on the different farm types, this study used existing material from the USDA 2007 Census data to determine a “baseline” of labor used on the “average” farm—this data was available in terms of the average number of workers per acre by county (United States Department of Agriculture, 2009: 2007 Census Publications, Volume 1, Chapter 2: County Level Data for Washington and California). We determined the average number of workers per acre by county by dividing the number of workers per county (USDA, 2009, Table 7 for Washington and California) by the amount of acres of farmland per county (USDA, 2009, Table 1, for Washington and California). Table 7 in USDA (2009) for each state also quantifies workers in each county who worked 150 days per year or more, and those who worked less than 150 days. For the purposes of our analysis, these were classified as “seasonal” (less than 150 days) or “full-time” workers (150 days or more).¹

Organic Survey Data Collection

To determine the number of workers per acre on certified organic farms, and their lengths of employment, we sent electronic surveys to all organic farmers in California and Washington for whom email addresses could be obtained. An email with a link to a survey was sent to a combined 1,844 organic farmers; 637 emails were sent to organic farmers in Washington and 1,207 were sent to organic farmers in California. Adobe FormsCentral was used to send the survey forms and to collect the data the respondents completed. The email addresses of organic farmers were obtained from the California

Comment [JM1]: I remember a comment from you guys about this, might want change to reflect actual variable, proportion of jobs w/ duration > 150 days/year, i see, you define it as full-time in the section...think that's okay Jahi?

Certified Organic Farmers (CCOF), which had a public list of 1,362 email addresses for the roughly 3,274 organic farms in California, according to Melissa Munoz at the California Department of Food and Agriculture (CDFA) (*personal communication to the first author*, dated 12/20/11). CCOF is one of the largest certifiers in California.

However, it should be noted that the organic farms they certify only represent a portion (albeit a large one) of all the organic farms in California. With respect to Washington, the Washington State Department of Agriculture's Organic Food Program provided a list of email addresses for 637 organic farms out of the roughly 762 organic farms statewide.

The survey sent out to organic farmers consisted of eight questions. The questions mirrored a number of the questions asked on the USDA Census of Agriculture 2007. The wording of the organic survey was intentionally the same as the USDA survey so that results would be comparable.

Of the 1,207 emails sent to organic farmers in California state, 149 emails failed to find a recipient, and 9 emails were returned informing us that they were not in fact organic producers, or that they had given up on organic farming. Ultimately, 1,049 emails were counted as having been sent to organic farm producers in California. 51 organic farms responded to the survey. The response rate for California is 4.9%.

Of the 637 emails sent to organic farmers in Washington, 34 emails failed to find a recipient, and 11 emails were sent back indicating that they were not farming in the state of Washington or that they were no longer farming organically. Ultimately, 592 emails were counted as having been sent to organic farm producers in Washington. 67 organic farms responded to the survey. The response rate for Washington is 11.3%.

The combined effective response rate is 7.2%, with a combined total of 118

usable responses out of 124 total responses from California and Washington, responding to 1,641 surveys sent to organic farmers in either state.²

Of the 118 usable responses from organic farms, 45 of the surveys (nearly 40% of the responses received) were concentrated in 10 of the 97 counties. In order to maintain the feasibility of county-level analysis, our study focused on these 45 respondents in detail and did not consider counties with less than four responses per county; many counties had only one, two or three farms that responded to the survey. The counties considered in this paper are Grant, Island, Lewis, Okanogan, Skagit, Thurston, and Yakima (Washington state); and San Luis Obispo, Santa Cruz, and Sonoma in California.

Additional Data Collection

In order to calculate the effects of different farm sizes and crop type on the number of workers per acre on average farms versus organic farms, additional information that was not found in online published data from the USDA 2007 Census of Agriculture was requested from the USDA in the form of special tabulation data from the National Agriculture Statistics Service (NASS). Using County Level Data from the 2007 Census of Agriculture, the NASS cross-tabulated portions of Tables 1, 7, and 45 to provide a more disaggregated view of the data. However, to avoid disclosing sensitive farm data that might be used to identify specific farms, the NASS withheld critical detail at times, ultimately limiting our ability to use this additional information in our analysis, as noted in *Study Limitations*, above.

Data analysis

We used mixed-effects models to assess possible effect and magnitude of farm type (fixed effect) and county (random effect) on the number of workers/acre and the

proportion of full-time employees (those employed 150 days or more). County was originally nested as a variable within state, but state was removed from analysis because county alone had as much explanatory power when analyzed independently as it did as a nested variable. We arcsine-square root transformed workers/acre to normalize it, and back-transformed the confidence intervals. Proportion of full-time employees was normally distributed and did not require transformation. We fit linear mixed-effects models (LMMs) in R (version 3.4.0, R Core Team, 2017) using the “lme4” package (version 1.1-13, Bates *et al.* 2015). Due to variations in survey responses, we had insufficient data to include the other variables as covariates (such as crop type or farm size), which may otherwise have been able to increase model fit. For each model, we calculated the 95% confidence interval for the effect of farm type and the marginal and conditional R^2 values. R^2 values were used to assess model fit. We compared the marginal and conditional R^2 values to assess the amount of variance explained solely by the fixed effects (marginal) and the combined variance explained by the fixed and random effects (conditional).

Results

Amount of labor on organic and average (non-organic) farms

Analysis with Linear Mixed Models found that organic farms hire more workers/acre and employ a greater proportion of full-time employees than their conventional counterparts. Farm type (organic or conventional) accounted for 52% of the variation in workers per acre, and 26% of the variation in the proportion of full-time employees (Table 1).

Comment [JC2]: James: please add these references to the reference list

These findings support the hypothesis that in general, organic farms employ more labor per acre than an average farm; and that a greater portion of this labor is full-time.³ In the aggregate for the ten counties, when compared with the USDA average farm data for the same counties, the average number of workers per acre by county was greater on organic farms in seven counties across the two states: Grant, Island, Okanogan, Santa Cruz, San Luis Obispo, Thurston and Yakima. Lewis and Skagit County in Washington State had more workers per acre on average farms than on organic farms. Sonoma County had an equal number of workers per acre. In the three counties where the differences were most dramatic (Grant, Okanogan and Yakima) the results all pointed toward greater labor per acre on organic farms (Table 1A).

Seasonal versus full-time labor

The USDA 2007 Census of Agriculture uses the 150 days designation to distinguish between relatively permanent and temporary employment. The organic survey followed the same convention as the 2007 USDA Census of Agriculture in measuring how long workers were working on an organic farm - (See Appendix A) so that comparisons between the two surveys could be made.

The concept behind this table is to demonstrate the potential of organic farming to hire workers that work more than a season (ostensibly three months). Given the lack of data, this study does not consider how much longer after 150 days a worker remains on a farm. But it is nevertheless one of only a few empirical studies to build a picture of the work environment around organic farms in the US (Table 1B)

The data demonstrates that in eight counties, organic farms have more workers per acre that work more than 150 days than average farms. In other words, when looking

Comment [JC3]: I cut the description of these tables; if they are in the appendix, the descriptions shouldn't be included here.

exclusively at the data on workers who are in relatively long-term employment situations, the tendency for organic farms to employ more workers per acre becomes even more pronounced (Table 1C).

Discussion, Limitations, and Areas for Further Study

The contribution of this study to the literature of organic and conventional agriculture is that it looks at the job-creating ability of organic farming for on-farm labor in two western states in the United States. This study supports the argument that organic farming requires more labor than conventional farming. This is consistent with most of the previous research from the United States and Europe (with the occasional exception as observed in the Introduction), although our study makes use of new and differently collected data. In particular, there are only a limited number of studies in the United States that collected detailed data at the county or state level, or collected data on seasonal versus fulltime workers. And very few studies in the United States or Europe have been published in the peer-reviewed literature.

The employment potential of organic agriculture was particularly strong in Thurston and Santa Cruz counties (see Tables in the Appendix). These are both counties in close proximity to major urban areas but with substantial rural land. Such urban-rural counties might be the best places for planners to begin considering how organic agriculture might be integrated into broader policy goals of job creation, environmental protection and human health, a consideration that will be touched on further in the policy implications section below.

Our study is also one of the few U.S. -based works that has examined the length of employment on organic farms, finding that, the proportion of workers that worked 150 days or more is higher on organic farms than on an average farm in eight out of the ten studied counties (and is statistically significantly higher on average). This matches the results of Strohlic et al. (2008), who found that “organic production is also associated with greater opportunities for permanent employment,” (p. 8). Greater durations of employment raise the possibility that organic farms provide better quality jobs, at least in terms of job tenure. Whether this translates into better jobs in terms of wages and other benefits is an open question. There are compelling reasons to be very cautious about equating this greater proportion of full-time workers with higher quality jobs or the ability to organize. Research has clearly found that organic farming is by no means a necessary indicator of support on the part of the farmer for workers’ rights and quality of life (Getz et al., 2008; Guthman, 2014 Shreck et al., 2006).

There are important limitations to this study. The response rate to the organic survey is low and therefore the strength of the comparisons between average farms and organic farms is restricted. This low response rate was a particular problem in California. Furthermore, the data provided from the NASS is incomplete. These factors limited the opportunities for direct comparisons, and increase the need for further research in this area.

Importantly, unpaid farm worker internships were not accounted for in the job creation discussion of organic farming. Many organic farms make use of unpaid interns, a practice that may have skewed the results. Rather than respond to the organic survey, one respondent wrote a letter highlighting complexities of farm labor. He wrote:

The prevalence of unpaid (or minimally paid) interns and apprentices on small organic farms has been on the rise for many years to the point that they represent a fairly essential part of the agricultural workforce for growers on the 1 to 20 acre scale... The effect, however, is that there is a sizable workforce that exists in a shadowy realm where growers do not even regard their contributions as “work”, per se—oftentimes creating a grossly skewed perception of the man hours required to run the farm.

To address some of these questions, future research should consider the quality of jobs on organic farms and wages earned in a much more granular manner—which may increase the challenges of such research, considering that wages and treatment of employees are often highly sensitive topics. One useful approach might be to examine if workers feel conditions are better on organic farms compared to other farms where they have worked. Detailed comparative case studies that build on established relationships of trust between researchers and stakeholders are an important potential approach to get at more of these qualitative issues. Further, future research should include surveys and data for explicitly conventional farms rather than data averaged over all farms.

Lastly, it should be noted that other factors such as primary crop type and marketing strategy have also been found to impact employment quantity and conditions. For example, a study from the Leopold Center for Sustainable Agriculture demonstrated that if some farmers were to increase their production of certain types of fruits and vegetables and if they were sold to the local/regional market via farmstands and farmers markets, there could be a significant surge in workers needed (Swenson, 2010); Lobley et

al. (2005) report similar findings from the UK. Farm size, predictably, also strongly affects labor requirements for labor (Morison et al., 2005; Strohlic et al., 2008). Information relevant to these factors was collected for this study, the data was not sufficient for proper statistical analysis.

So although the existing literature demonstrates the importance of factors in addition to farm type (organic or conventional) in predicting labor needs, focusing on farm type as one important factor that may positively contribute to community economic development appears to be called for, based on our results and the weight of previous evidence in the peer-reviewed and gray literatures.

Policy Implications

While there are many opportunities for further study, based on our results and the weight of previous evidence in the peer-reviewed and non-peer reviewed literature, we believe that it is appropriate for policy makers to consider organic agriculture as an element of a regional job creation and economic growth strategy. Promoting organic agriculture as an economic development strategy is not a new idea (Morison et al. 2005; Maynard and Green 2006; Lobley et al. 2005) but it does bring a potential benefit because additional land would not necessarily be required.⁴ Transitioning conventional farmland to organic production could increase the demand for farm labor within the region.

Despite repeated evidence of its potential, local governments do not commonly consider organic agriculture as part of their job creating strategies. However, policies to preserve farmland and promote local food production, and enhance the quality of life through urban agriculture are increasingly frequent elements of urban and regional

planning and community development efforts in American cities. Several city governments have adopted policies to promote urban agriculture, but reviews of such policies reveal that economic development and, more specifically, employment are rarely part of the reasons for doing so.

To employ more people countywide, it appears that policies to specifically promote organic farmers would be appropriate. Although insufficient for statistical analysis, our data also indicated that a focus on small farms and those that grow fruit and nuts, and/or vegetables and melons might be most effective. Therefore, counties should arguably include organic agriculture in their economic development plans if they want to create more jobs, in addition to protecting environmental quality and preserving and encouraging rural communities (Chappell and LaValle, 2011; Kremen and Miles, 2012; Lobley et al., 2005; Morison et al., 2005). Rather than leave farms and rural areas to suffer from rural flight and urban sprawl in resource-scarce areas or from dwindling agricultural income, county economic plans can implement policies that revitalize agriculture by promoting and subsidizing the transition to or inclusion of organic farming. County governments, particularly those with available rural land but also substantial urban populations may be the best level of government to explore the employment potential of organic and small farm agriculture.

As mentioned above, two counties from our study—Thurston County, WA and Santa Cruz County, CA— showed the strongest relationship between organic farming and on-farm labor. These counties, which combine a supply of rural land with proximity to urban centers, may hold the strongest potential for incorporating organic agriculture into economic development planning. Thurston and Santa Cruz counties already have

several policies in place that work to preserve agricultural land, viewing it as a viable and necessary good for communities. Thurston County seeks to preserve its farmland through the Conservation Futures Program, which attempts to provide matching funds needed by farms for state and federal agencies grant money to agricultural land preservation; and the Development Rights Program, which allows land owners to remain on their land while selling their land rights to conservation groups (Thurston County, Washington, Executive Summary, 2009). Santa Cruz County has the Williamson Act Program, which seeks to preserve agriculture through zoning laws that allows the land to be perpetually agricultural (County of Santa Cruz, Planning Department, 2012). While these policies do not specifically promote organic or labor-intensive agriculture, such goals could be incorporated into these types of programs.

Potential promotion of organic farming also has a place at the national level. This would be in line, from a certain point of view, with long tradition: the US Government has consistently promoted specific types of agricultural development through the Farm Bill and other legislation. Of course, crop subsidies, price insurance and research and extension efforts have often been criticized as favoring large scale and conventional agriculture (Lehrer, 2010), so a restructuring of the Farm Bill to promote organic and small scale agriculture would need to overcome entrenched interests (Graddy-Lovelace and Diamond, 2017). Alternatively, another approach that has been taken by several U.S. Senators and Representatives has been to sponsor separate legislation outside of the Farm Bill. The most relevant of these efforts for the current study is the *Local Farms, Food, and Jobs Act of 2013* sponsored by Senator Sherrod Brown of Ohio and Representative Chellie Pingree of Maine. Among other provisions, the act directed the Risk Management

Agency (RMA) to offer crop price insurance for organic crops and stabilize funding for the Organic Cost Share Certification Program. However, the act only attracted 20 co-sponsors in the Senate and 75 in the House.

State legislation to promote organic and local farming has also been difficult. The Illinois legislature passed the Illinois Food, Farms, and Jobs Act in 2009, which created a “Local and Organic Food and Farm Task Force” mandated to develop a promotional strategy to promote local and organic food production (Goldstein, 2011). The task force had substantial representation from the organic community including four organic farmers, two processors and one certifier, but appears to have been defunct since at least 2014—and by the time the task force had finalized its report, the promotion of organic had been largely dropped from its agenda. Nonetheless, and given the caveat that policy-making is distinctly and powerfully affected by many factors besides evidence (Cairney, 2016), ideas and research can help “soften up” policymakers to new ideas and encourage them to, eventually, “jump on the bandwagon” (Kingdon, 2011). This study may make one small contribution in this direction.

While organic agriculture may be only a small part of development policy in the near term, continuing this effort may eventually contribute to a rethinking of the nature of local development (cf. Orr, 1994); the roles of *ideas* and *ideals* in realizing such changes has often been overlooked in scientific literature (Béland, 2016; Kingdon, 2011; Meadows, 1996). The type of local development organic farms would likely support could provide jobs, improved health, food security and new relationships between producers and consumers, such that investing in organic food agriculture became a way to invest in the ultimate success of the community. This would go against a decades long

trend to decrease the amount of labor on farms. Organic farming's potentially unique opportunities for rural development fit into the larger confluence of contemporary interest in sustainable and just food systems .

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Response	Number of workers/acre		Proportion full-time	
R2	Marginal	Conditional	Marginal	Conditional
	0.52	0.67	0.26	0.54
Coefficient Estimates				
Name	2.50%	97.50%	2.50%	97.50%
Intercept	0.01	0.06	0.17	0.45
Organic*	0.02	0.12	0.13	0.43

Table 1 Summary of linear-mixed models for both response variables, *organic compared to all farm-types, a negative value would indicate organic farms have less while a positive number indicates more

Table 1A Average number of workers by acre

	Average Farms	Organic Farms	% Greater labor on organic farms
Grant	0.03	0.35	1066
Island	0.03	0.04	33
Lewis	0.02	0.01	-100
Okanogan	0.01	0.6	5900
San Luis Obispo	0.01	0.03	200
Santa Cruz	0.28	0.31	11
Skagit	0.07	0.03	-133
Sonoma	0.03	0.03	0
Thurston	0.03	0.21	600
Yakima	0.04	1	2400

Table 1B Comparison of workers that work more than 150 days on average farms and organic farms by county

	All	% of total workers that work more than 150 days	O	% of total workers that work more than 150 days	All	% of total workers that work more than 150 days	O	% of total workers that work more than 150 days
	Gra	%	Gra	%	Isl		Isl	
Total Workers	34,418		487		491		6	
Workers that worked more than 150 days	7,386	21.47	46	9.45	92	18.74	6	100
Workers that worked less than 150 days	27,032		441		399		0	
	All	% of total workers that work more than 150 days	O	% of total workers that work more than 150 days	All	% of total workers that work more than 150 days	O	% of total workers that work more than 150 days
	Lew		Lew		Okan		Okan	
Total Workers	2,104		12		13,422		97	
Workers that worked more than 150 days	514	24.43	5	41.67	1,831	14	47	48.45
Workers that worked less than 150 days	1,590		7		11,591		50	
	All	% of total workers that work more than 150 days	O	% of total workers that work more than 150 days	All	% of total workers that work more than 150 days	O	% of total workers that work more than 150 days
	San Luis		San Luis		Santa Cruz		Santa Cruz	
Total Workers	9,175		6		13,167		8	
Workers that worked more than 150 days	4,370	48	3	50	7,851	60	7	87.5
Workers that worked less than 150 days	4,805		3		5,316		1	

		% of total workers that work more than 150 days	O	% of total workers that work more than 150 days	All	% of total workers that work more than 150 days	O	% of total workers that work more than 150 days
	All		O		All		O	
	Ska		Ska		Son		Son	
Total Workers	7,176		44		13,799		15	
Workers that worked more than 150 days	2,465	34.35	28	63.64	5,458	39.55	10	66.67
Workers that worked less than 150 days	4,711		16		8,341		5	
		% of total workers that work more than 150 days	O	% of total workers that work more than 150 days	All	% of total workers that work more than 150 days	O	% of total workers that work more than 150 days
	All		O		All		O	
	Thur		Thur		Yak		Yak	
Total Workers	2,578		19		62,177		72	
Workers that worked more than 150 days	1,001	38.83	14	73.68	9,749	15.68	4	5.5
Workers that worked less than 150 days	1,577		5		52,428		68	
<i>Gra= Grant County, Isl= Island County, Lew= Lewis County, Okan= Okanogan County,</i>								
<i>San Luis= San Luis Obispo County, Ska= Skagit County, Son= Sonoma County, Thur= Thurston County, Yak= Yakima County</i>								

Table 1C Average number of workers that worked more than 150 days per acre by county

	More than 150 days	More than 150 days	
	Average Farms	Organic Farms	Proportion of labor/acre on organic farms vs. average farms
Grant	0.01	0.03	300%
Island	0	0.04	--
Lewis	0	0	0%
Okanogan	0	0.21	--
San Luis Obispo	0	0.02	--
Santa Cruz	0.16	0.27	168.75%
Skagit	0.02	0.02	0%
Sonoma	0.01	0.02	200%
Thurston	0.01	0.16	1600%
Yakima	0.01	0.05	400%
Average	0.022	0.082	372%*

* Based on Averaged per-county Totals

2012 Survey of Organic Farms

- 1 In what state is your farm?
State: CA or WA
- 2 Location of agricultural activity for this operation:

In what county was the largest value of your agricultural products raised or produced?
A In what county was the largest value of your agricultural products raised or produced?

If you also had agricultural activity in any other county, enter the county name(s), etc.
B

Other county name	State	# of acres
- 3
 - A All land owned? None or Number of acres
 - B All land rented or leased from others? None or Number of acres
 - C All land rented or leased to others? None or Number of acres
 - D Total acres in this operation for this survey? Add items A and B and subtract C
- 4 Is any of your land organic? Yes No

How many certified organic acres does the farm have? Land in acres _____

Does the farm have land in transition? Yes No
How many acres?
Does the farm have land that is organic that is not intended for certification? Yes No
How many acres?

How many hired farm or ranch workers, including paid family members and office workers:
5
 - A Worked less than 150 days on this operation in 2011? Exclude contract labor.
None # of hours
 - B Worked 150 days or more on this operation in 2011? Exclude contract labor.....
None # of hours

6	<p>Were any migrant workers on this operation in 2011? Include hired and contract workers. A migrant worker is a farm worker whose employment required travel that prevented the migrant worker from returning to his/her permanent place of residence the same day.</p> <p>Yes No</p>
7	<p>Value of sales- report gross value of agricultural products sold from this farm in 2011. Include the value of your landlord's share, marketing charges, taxes, hauling etc. Exclude dollars for items produced under production contracts.</p>
8	<p>Choose the NAICS codes that best describes the operation:</p> <p style="text-align: right;">Total Acres/ Tenths</p> <p>Oilseed and grain farming (1111)</p> <p>Vegetable and melon farming (1112)</p> <p>Fruit and tree nut farming (1113)</p> <p>Greenhouse, nursery, and floriculture production (1114)</p> <p>Other crop farming (1119)</p> <p>Tobacco farming (11191)</p> <p>Cotton farming (11192)</p> <p>Sugarcane farming, hay farming, and all other crop farming (11193,11194,11199)</p> <p>Beef cattle ranching and farming (112111)</p> <p>Cattle feedlots (112112)</p> <p>Dairy cattle and milk production (11212)</p> <p>Hog and pig farming (1122)</p> <p>Poultry and egg production (1123)</p> <p>Sheep and goat farming (1124)</p> <p>Animal aquaculture and other animal production (1125,1129)</p>

¹ This classification of workers in the US agricultural data goes at least as far back as the 1954 census (U.S. Bureau of the Census, 1956, Volume II, Ch. IV, p. 235).

² Six responses were from farms that were outside the scope of the survey, as they were located in another state; no longer farming organically; or had gone out of business.

³ Three additional tables report the research findings from an aggregated perspective (see Appendix). These tables present and compare the number of workers per acre on organic farms and the average farm by county.

⁴ Conversion to organic and its effects on agricultural land demand is heavily contested within the “land sparing vs. land sharing” debate, which we will not cover here. In short, the effects of conversion to organic agriculture on agricultural land expansion and biodiversity are not neither straightforward nor uniformly tied to expansion (Fischer et al., 2014; Salles et al., 2017).